REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. In particular, Applicants have amended claim 33 to recite that the (A) polyimide resin contains "one or more polyimide resins". In addition, Applicants have cancelled claim 20 without prejudice or disclaimer.

Initially, it is respectfully requested that the present amendments be entered. Clearly, entry of the cancellation of claim 20 after final rejection is proper, noting 37 CFR 1.116(a). Moreover, noting the suggestion by the Examiner in Item 7 on page 3 of the Office Action mailed December 10, 2008, for which the Examiner is thanked, it is respectfully submitted that the amendment of claim 33 does not raise any new issues, including any issue of new matter, materially limits issues remaining in the application (by obviating the rejection of claim 33 and claims dependent thereon under the second paragraph of 35 USC 112), and is timely.

In view of the foregoing, it is respectfully submitted that Applicants have made the necessary showing under 37 CFR 1.116(b)(3); and that, accordingly, entry of the present amendments is proper, notwithstanding the Finality of the Office Action mailed December 10, 2008.

The claims withdrawn from consideration in the above-identified application, based upon the elections in response to the restriction requirement/election-of-species requirement in the Office Action mailed September 20, 2007, set forth in the Response filed December 13, 2007, are noted. Upon allowance of generic claims in the application, the claims directed to non-elected species should be re-joined in the above-identified application and allowed to issue in a patent therefrom.

In addition, it is respectfully submitted that where claims directed to the adhesive film as presently being considered on the merits in the above-identified application are allowable, then claims directed to an adhesive sheet and to a semiconductor device, each using such adhesive film, should also be allowable in the present application. Accordingly, upon allowance of, e.g., claim 33, it is respectfully requested that the Examiner re-consider and rejoin the Groups II and III claims, as in the Office Action mailed September 20, 2007, in the above-identified application, and allow such Groups II and III claims to issue in a U.S. patent based upon the above-identified application.

Rejection of Applicants' claims being considered on the merits, under the second paragraph of 35 USC 112, set forth in Items 6-8 on page 2 of the Office Action mailed December 10, 2008, is noted. Rejection of claim 20 is moot, in light of cancelling of this claim. Moreover, it is respectfully submitted that the rejection of claim 33 and claims dependent thereon is moot, in light of amendment of claim 33 to delete the phrase "kinds of", with corresponding reference to polyimide "resins".

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed March 27, 2008, that is, the teachings of U.S. Patent Application Publication No. 2001/0035533 to Takeda, et al, and Japanese Patent Document No. 11-140386 (designated by the Examiner as "Takashi et al."), under the provisions of 35 USC 102 and 35 USC 103.

It is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such an adhesive film as in the present claims, having, inter alia, the polyimide resin with SP value, weight average

molecular weight and Tg as in the present claims, the adhesive film having a tan δ peak temperature and flow amount as in the present claims, with amounts of (B) epoxy resin and (A) polyimide resin as in the present claims; and, moreover, wherein the polyimide resin contains one or more polyimide resins, at least one of which is obtained utilizing a diamine and acid dianhydride satisfying the condition where a difference between heat generation initiating temperature and heat generation peak temperature is a value as in the present claims, with such polyimide obtained by reacting such diamine and such acid dianhydride being contained at 50% by weight or more of a total polyimide resin. See claim 33.

Furthermore, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such adhesive film as in the present claims, having features as discussed previously in connection with claim 33, and, moreover, wherein the epoxy resin contains a tri-or more functional epoxy resin and/or an epoxy resin which is solid at room temperature (note claim 2); and/or wherein the adhesive film also contains an epoxy resin curing agent (see claim 6, and claims dependent thereon) or a filler (see claim 15, and claims dependent thereon).

The present invention as claimed in the above-identified application is directed to an adhesive film, as well as an adhesive sheet and a semiconductor device using such film.

Previously, in connecting a semiconductor chip and a semiconductor chip-carrying support member, a silver paste has been mainly used. However, with recent miniaturizations, it has been necessary to find other materials for such connection.

In addition, through recent advances in miniaturization and thinning of semiconductor chips, wherein such chips and the wafer from which such chips are formed is very thin, the wafer is fragile and is easily cracked; and, in order to prevent cracking of the wafer, a procedure of applying, as a protecting tape, a polyolefin-based back grind tape to the surface of the wafer, has been adopted. However, since a softening temperature of the back grind tape is 100ºC or lower, it has been demanded that an adhesive film, which can be laminated on a back of a wafer at a temperature of 100ºC or lower, be provided. Note the sole full paragraph on page 3 of Applicants' specification. Furthermore, it is required that easy peelability be achieved between the adhesive film and a dicing tape, and it is desired that the adhesive film has a low temperature laminating property and resistance to re-flowability, so that a reliable package can be achieved.

Against this background, and in light of the desire to provide an adhesive film having both a low temperature laminating property and resistance to re-flowability, Applicants achieve this objective by the adhesive film of the present invention, utilizing a polyimide resin having properties as set forth in the present claims, with amount of polyimide resin and epoxy resin in the adhesive film as in the present claims, and with the adhesive film having a tan δ peak temperature and flow amount as in the present claims.

In particular, by utilizing a polyimide having a Tg as in the present claims, the adhesive film has a desired laminating temperature, adverse effects on a back grind tape are avoided, and warpage of a semiconductor wafer is suppressed. Note, for example, the paragraph bridging pages 23 and 24 of Applicants' specification. By utilizing a polyimide having a weight average molecular weight as in the present claims, acceptable film-forming properties, and strength of the film, are achieved,

while deterioration of flowability at heating and reduction of embedding properties in irregularities on a substrate, are avoided. Moreover, by using a polyimide with Tg and a weight average molecular weight of the polyimide as in the present claims, not only a laminating temperature can be reduced, but also a heating temperature (die bonding temperature) when a semiconductor chip is adhered and fixed to a semiconductor chip-carrying support member can be reduced, and an increase of warpage of a chip can be suppressed. Note the paragraph bridging pages 24 and 25 of Applicants' specification.

By utilizing a polyimide resin also having a SP value as in the present claims, a reduced intramolecular cohesive force is avoided, so that an increase in hot flowability of an adhesive film in B stage does not become unduly large, and a reduction in adherability of the adhesive film with a substrate is avoided, while an increase in water absorption of an adhesive film is avoided. Note the last full paragraph on page 25, as well as the paragraph bridging pages 25 and 26, of Applicants' specification.

It is noted that according to the present invention, a desired tan δ peak temperature is achieved while still including a polyimide resin of a desired SP value, as described in the last full paragraph on page 28 of Applicants' specification.

As to advantages of the present invention having a tan δ peak temperature and flow amount as in the present claims, note also the paragraph bridging pages 45-47 of Applicants' specification.

It is emphasized that an objectives of the present invention are to realize both a low temperature laminating property and resistance to re-flowability, and that these objectives can be achieved according to the present invention using a specific polyimide resin with specific properties such as SP value, Tg (of -20 to 60ºC) and

weight average molecular weight (of 10,000 to 200,00), by using a polyimide obtained by reacting a diamine and an acid dianhydride satisfying a condition of difference in heat generation initiating and peak temperatures as in claim 33, and by using the epoxy resin in amounts relative to that of the polyimide resin as in claim 33. The Tg of the polyimide resin is an important feature of the adhesive film of the present invention. With a Tg as in the present claims, the adhesive film is allowed to have a tan δ peak temperature of -20 to 60ºC, and to achieve a low temperature laminating property.

Takeda, et al. discloses a semiconductor device having a support member such as a lead frame, to which a semiconductor die or chip is attached using a die-bonding material. The die-bonding material is a filmy organic die-bonding material causing no reflow cracks and having good reliability, and is mainly made of an organic material such as an epoxy resin, silicone resin, acrylic resin, or polyimide resin (including an organic material containing a metal filler or an inorganic material filler added thereto). Note especially paragraphs [0012] and [0013] on page 1 of this patent document. Note also paragraphs [0019], [0021], and [0023]-[0025] on pages 1 and 2 of this patent document. See also paragraph [0041] on page 3 of this patent document, disclosing that polyimide resin is preferred as the organic material constituting the filmy organic die-bonding material. See also paragraph [0165] on page 5 of this patent document, describing various epoxy resins which may be used for the die-bonding material. As applied by the Examiner, see also Example 1 in paragraphs [0171]-[0180] on pages 5 and 6 of this patent document, describing a die-bonding material including 100g of polyimide for each 10g of epoxy resin.

No. 11-140386 discloses an adhesive film of which the weight loss after heating for two minutes at 250ºC is 100 μf or less per mm^3 of the film. Such film is

obtained by mixing a thermoplastic resin, a thermosetting resin having a molecular weight of 400-1500, and if necessary a filler, in an organic solvent; forming a layer, from the resultant mixture, on a substrate; heating and drying the layer; and removing the substrate. This patent document goes on to disclose that a polyimide resin is suitable as the thermoplastic resin, and an epoxy resin as the thermosetting resin. Note the English-language abstract of No. 11-140386. See also paragraphs [0001], [0008], [0015] and [0018] of the machine-generated English translation of No. 11-140386.

It is respectfully submitted that neither of Takeda, et al. or No. 11-140386 would have disclosed or would have suggested the presently claimed adhesive film, including, inter alia, the SP value and weight-average molecular weight, or Tg, of the polyimide; or wherein the polyimide resin contains at least one polyimide resin obtained by reacting the specified diamine and acid dianhydride satisfying the condition as in claim 33; or tan δ peak temperature and flow amount of the adhesive film as in the present claims, and advantages thereof, as discussed in the foregoing.

It is emphasized that the present invention achieves both a low temperature laminating property and resistance to re-flowability, using a specific polyimide resin having specific properties, using specific raw materials of the polyimide, and as well by using specific amounts of polyimide resin and epoxy resin, as in the present claims. It is respectfully submitted that Takeda, et al. and No. 11-140386, directed to different objectives (that is, respectively providing a die-bonding material for bonding a chip to a lead frame, that causes no reflow cracks and has good reliability; and withstanding soldering heat in mounting, reduction of generation of an outgas and avoiding staining of semiconductor elements or a heating apparatus), would have neither disclosed nor would have suggested the presently claimed adhesive film,

including materials with properties as in the present claims, and with amounts of the materials, and advantages achieved thereby, including wherein a low temperature laminating property and resistance to re-flowability is achieved.

The contentions by the Examiner in the Office Action mailed December 10, 2008, that it is reasonable to presume that the properties of SP, weight average molecular weight, difference between heat generation initiating and peak temperatures and Tg of the polyimide; and tan δ peak temperature and flow amount of the adhesive film, are present in the applied references, are respectfully traversed. As seen in the foregoing, as well as from a full review of Applicants' disclosure, Applicants provide guidance in connection with choosing specific materials and amounts thereof, and having properties as in the present claims, achieving advantages as discussed previously.

Moreover, the following is noted. Polyimides A-F of Takeda, et al. respectively have Tg's, in ºC, of 212, 187, 200, 170, 142, and 115, each outside the scope of the present claims. Polyimides A-C of No. 11-140386 respectively have Tg's, in ºC, of 114, 170, and 111, each also outside the scope of the present claims. It is respectfully submitted that this shows that the Examiner errs in "presuming", without any evidence in support thereof, that the various properties are present in the applied references.

In addition, attention is respectfully directed to Comparative Examples 3, 7 and 8 of Applicant' disclosure, using polyimides G or L, the polyimides being described on pages 67, 68, 71 and 72 of Applicants' specification. These polyimides have Tg's outside the scope of the present claims. The adhesive films of Comparative Examples 3, 7 and 8 do not have features of the present invention, including tan δ peak temperature. It is respectfully submitted that this evidence in

Applicants' specification also rebuts the presumption by the Examiner that various properties set forth in the present claims, including Tg and tan δ peak temperature, would be included in the materials disclosed in the applied references, merely in light of procedures described in the references for forming the materials.

In view of the foregoing, it is respectfully submitted that the descriptions in Takeda, et al. and No. 11-140386, directed to different properties of the described materials, would have neither disclosed nor would have suggested the present adhesive film, including incorporating a polyimide resin having properties as discussed previously, with the adhesive film having properties as discussed previously, and advantages due thereto.

The Examiner's contention that based on the teachings of the applied references, the burden has shifted to Applicants to show that the prior art materials do not have properties as in the present claims, is respectfully traversed. It is respectfully submitted that the rationale by the Examiner concerning the processing , does not shift the burden.

In any event, it is respectfully submitted that the foregoing, especially the evidence of record in Comparative Examples 3, 7 and 8 as discussed previously, rebuts any possible presumption raised by the Examiner as to same properties in materials in the applied references.

In view of the foregoing comments and amendments, entry of the present amendments, and reconsideration and allowance of all claims being considered on the merits in the above-identified application, are respectfully requested. In addition, rejoinder of claims directed to non-elected species, with allowance of such claims in the above-identified application, is respectfully requested; and it is further respectfully requested that the Examiner re-join claims directed to the Groups II

and III inventions as set forth in the Office Action mailed September 20, 2007, and allow such claims to also issue in a U.S. Patent on the above-identified application.

To the extent necessary, Applicants hereby petition for an extension of time under 37 CFR 1.136. Kindly charge any shortage of fees due in connection with the filing of this paper, including any extension of time fees, to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (case 1204.45684X00), and please credit any overpayments to such Deposit Account.

Respectfully submitted,

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